1) Sketch an outline of each of the following proof methods. (10 points each)
   a. Proof of an equality
   b. Proof of an implication
   c. Proof of a subset
   d. Proof of an if-and-only-if.
   e. Proof of an existential
   f. Proof of a universal
   g. Proof by cases

2) Explain what the following means. \(\forall \varepsilon > 0 \exists N \in \mathbb{Z}_{\geq 0} (n \geq N \implies |a_n| < \varepsilon)\) (15 points)

3) Write the following statement in mathematical notation: “There is a number whose square is smaller than any real number” (15 points)
4) Let \( f_n(x) = x^n \). Show that for all \( z > 0 \), there is an \( n \in \mathbb{R} \) such that \( f_n(2) < z \)  (100 points)